

Study Links Child Behaviour Problems to Prenatal Tobacco Smoke Exposure and Traffic Density

More hours of sleep, a healthy diet, and strong parental ties to other families or friends are associated with better child behaviour

Barcelona, 26 April 2021 -. A pregnant woman's exposure to tobacco smoke and pollution from road traffic can influence the **development of behavioural outcomes in early childhood**. This is the conclusion of a recent [study](#) led by a team from the Barcelona Institute for Global Health (ISGlobal), a centre supported by the "la Caixa" Foundation. The study, published in *Environmental International*, is the first to investigate the **impact of the exposome**—i.e. the **set of all environmental exposures**, both chemical and non-chemical, during the prenatal and postnatal stages—on child behaviour. Previous research had assessed the impact of environmental exposures separately but not as a whole.

Childhood is a critical time for people's mental health and well-being, as it is the period when **brain development** accelerates. Although the causes of behavioural problems are not yet well understood, we do know that the limited genetic component involved in behavioural disorders interacts with multiple social and physical exposures, particularly during the sensitive **prenatal and early childhood** periods.

The study was based on data from the **large European Human Early-Life Exposome (HELIX)** project. The study population consisted of six longitudinal birth cohorts from **six European countries**. A total of **1,287 children between 6 and 11 years of age** underwent follow-up to characterise their exposures and assess behavioural problems. The researchers assessed **88 pregnancy exposures** and **123 childhood exposures**, encompassing the outdoor, indoor, chemical, lifestyle and social domains of the exposome.

Maternal Smoking and Road Traffic

During pregnancy, smoking and traffic were the factors most strongly associated with behavioural problems.

"We found that maternal tobacco smoke exposure during pregnancy was the **most important prenatal exposure** associated with emotional and behavioural problems in children," explained **Léa Maitre**, postdoctoral researcher at ISGlobal and lead author of the study. Maternal tobacco smoke exposure "is closely **linked to other co-exposures**, such as parental psychopathology symptoms, socioeconomic factors, the father's smoking habits and the home environment, in particular the quality of the attachment, support and stimulation that the child is exposed to at home," added Maitre. "This may account for a large part of the effect of maternal smoking during pregnancy on child behaviour."

The study also found that **increased residential traffic density** on the nearest road during pregnancy was associated with increased externalizing symptoms (i.e. aggressive and rule-breaking behaviours) and a higher attention deficit hyperactivity disorder (ADHD) index. A biological explanation is plausible, although the exact mechanisms remain elusive.

Postnatal exposure to tobacco smoke and car traffic density were not as strongly associated with child behaviour as prenatal exposures. This finding suggests that **pregnancy may be the period most sensitive** to the harmful effects of these exposures, due in part to the rapid development of the nervous system during this time window, but also because of exposures that occur *in utero*, among other hypotheses.

Good Sleep, Healthy Diet and Social Contact

The study also found that children aged 6-12 years who got **more hours of sleep**, ate a healthy (Mediterranean) **diet**, and whose parents had strong **family and social ties** had fewer internalising symptoms, i.e. withdrawal (e.g. not talking), somatisation (headaches), and anxiety or depression (nervousness).

In contrast, greater exposure to lead and copper, indoor air pollution and **unhealthy diet** were associated with increased behavioural problems.

In particular, a diet of ready-made food, sweets and caffeinated beverages was associated with an increased risk of **ADHD symptoms**, although impulsivity traits in children with ADHD can also lead to poor dietary choices and emotional eating.

One of the strongest associations with ADHD was in relation to the social and family ties of the parents (especially the mother): children whose parents had **contact with family or friends** less than once a week were 31% more likely to have ADHD symptoms.

Indoor air pollution in the home and levels of **copper and lead** in the blood were associated with increased behavioural problems in children.

“Our findings confirm the harmful role of maternal smoking and traffic exposure during pregnancy in childhood behavioural disorders, but they also underscore the potential protective role of a healthy family lifestyle during childhood, in particular diet, sleep and regular social contact,” commented **Martine Vrijheid**, head of the Childhood and Environment Programme at ISGlobal and last author of the study. “Early promotion of healthy family habits and regulation of air quality and lead exposure could help to prevent the future development of mental health disorders.”

The second author of the study, **Jordi Julvez**, a neuropsychologist and researcher at the Pere Virgili Institute of Health Research (IISPV-CERCA), underscored the importance of the study: “For the first time, human behavioural studies are taking into account a wide variety of environmental determinants and lifestyles in a single analysis, from the perspective of child psychological development. This is the closest we have come so far in adjusting our studies to the **multifaceted reality of human psychological development**.”

Reference

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About ISGlobal

The Barcelona Institute for Global Health, ISGlobal, is the fruit of an innovative alliance between the "la Caixa" Foundation and academic and government institutions to contribute to the efforts undertaken by the international community to address the challenges in global health. ISGlobal is a consolidated hub of excellence in research that has grown out of work first started in the world of health care by the Hospital Clínic and the Parc de Salut MAR and in the academic sphere by the University of Barcelona and Pompeu Fabra University. The pivotal mechanism of its work model is the transfer of knowledge generated by scientific research to practice, a task undertaken by the institute's Education and Policy and Global Development departments. ISGlobal has been named a Severo Ochoa Centre of Excellence and is a member of the CERCA system of the Generalitat de Catalunya.

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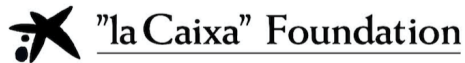
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